CLAIMS

We claim:

1. A method for determining hardware configuration scalability of a multi-user computer system, comprising:

   (A) loading a set of simulated actions grouped into action types and associated with a remote session;

   (B) measuring and logging response times for the set of simulated actions;

   (C) repeating (A) and (B) to obtain a plurality of response times;

   (D) aggregating the plurality of response times to obtain aggregated results;

   (E) splitting the aggregated results according to each action type; and

   (F) determining an associated break point for each said action type, wherein the associated break point corresponds to a minimally acceptable degree of performance for each said action type.

2. The method of claim 2, further comprising:

   (G) determining a number of users that the multi-user computer system can support from a plurality of associated break points.

3. The method of claim 1, further comprising:

   (G) fitting a performance curve for an action type for a plurality of performance instances, wherein each performance instance corresponds to a response time in response to an occurrence of a simulated user action; and

   (H) determining the associated break point from the performance curve.

4.   The method of claim 2, further comprising:

(H)   if the number of users does not equal or exceed a desired number of users,

enhancing the computer system's configuration; and

(I)   repeating (A) – (G).

5.   The method of claim 2, wherein the number of users corresponds to a processed

break point, wherein the processed break point is an approximate average of all break points

determined in (F).

6.   The method of claim 2, further comprising:

(H)   rank ordering the plurality of associated break points, wherein a first break

point corresponds to a best performance and a last break point corresponds to a worst

performance, wherein (G) comprises:

(i)   selecting an nth break point in response to (H), wherein the nth

break point corresponds to the number of users.

7.   The method of claim 2, wherein a selected break point is an approximate

weighted average of all break points determined in (F) and wherein the selected break point

corresponds to the number of users.

8.   The method of claim 2, wherein a processed break point corresponds to a

minimum of all break points determined in (F) and wherein the processed break point

corresponds to the number of users.

9.   The method of claim 2, wherein a selected break point corresponds to a maximum

of all break points determined in (F) and wherein the selected break point corresponds to the

number of users.

10.   The method of claim 1, further comprising:

(G)   configuring a client terminal to reflect a set of user actions that are associated with a type of user.

11.   The method of claim 1, further comprising:

(G)   configuring the multi-user computer system to execute at least one application program that is utilized by a type of user.

12.   The method of claim 11, wherein the type of user is selected from the group consisting of a knowledge worker and a data entry worker.

13.   The method of claim 1, wherein the multi-user computer system comprises a terminal server.

14.   The method of claim 1, wherein an initial response time of an action type is greater than a predetermined initial response time threshold and wherein the associated break point corresponds to an average response time having a predetermined degree of degradation.

15.   The method of claim 1, wherein an initial response time of an action type is less than a predetermined initial response time threshold and wherein the associated break point corresponds to an average of the predetermined initial response time threshold and an average response time having a predetermined degree of degradation.

16.   A computer-readable medium having computer-executable instructions for performing the method as recited in claim 1.

17.   A computer-readable medium having computer-executable instructions for performing the method as recited in claim 2.

18. The method of claim 3, wherein (G) comprises:

(i) fitting the performance curve with a moving average for a predetermined number of performance instances.

19. A method for determining hardware configuration scalability of a multi-user computer system, comprising:

(A) loading a set of simulated actions grouped into action types and associated with a remote session;

(B) collecting a plurality of indicators of memory management activity; and

(C) correlating a progression of working set trimming with an increase of active users.

20. The method of claim 19, wherein (C) comprises:

(i) trending peaks of a page output curve to form a peak page output trending line;

(ii) determining an intersection of the peak page output trending line to a page input line; and

(iii) determining a required amount of memory for each user from the intersection.

21.   The method of claim 19, wherein (iii) comprises:

(1)   determining a memory size component that is utilized for operating overhead of the multi-user computer system;

(2)   subtracting the memory size component from a total system memory size to approximate a user memory size component; and

(3)   dividing the user memory size component by a user load, the user load corresponding to the intersection.

22.   The method of claim 19, wherein (C) comprises:

(i)   determining a user load corresponding to a significant increase in page output rate; and

(ii)   in response to (i), dividing an available memory size by the user load to determine a required amount of memory for each user.

23.   The method of claim 19, wherein (A)-(C) are performed with a first memory configuration, the method further comprising:

(D)   repeating (A)-(C) with a second memory configuration;

(E)   determining a user load difference and a memory size difference with respect to the first memory configuration and a second memory configuration;

(F)   dividing the memory size difference by the user load difference to determine a required amount of memory for each user.

24.   The method of claim 20, further comprising:

(iv)   fitting page input data to form the page input line.

25.   A computer-readable medium having computer-executable instructions for performing the method as recited in claim 19.

26.   A computer-readable medium having computer-executable instructions for performing the method as recited in claim 20.

27.   The method of claim 19, wherein the plurality of indicators of memory management activity include a working set, a pages output rate, and a pages input rate.

28.   An apparatus for determining hardware configuration scalability for a multi-user computer system, comprising:

a test controller;

a plurality of client terminals that are configured by the test controller in accordance with at least one user type, wherein a set of user actions are generated;

the multi-user computer system that executes at least one application program in response to the set of user actions; and

a collection module that measures response times and that separately aggregates the response times for each action type, wherein each said action type is associated with a user type being simulated.

29.   The apparatus of claim 28, further comprising:

an analysis module that determines an associated break point for each said action type, wherein the associated break point corresponds to a minimally acceptable degree of performance in terms of response time for each said action type.

30.   The apparatus of claim 29, wherein the analysis module is supported by the test controller.

31.   The apparatus of claim 28, wherein the collection module is supported by the plurality of client terminals and test controller.

32.   A method for determining hardware configuration scalability of a multi-user
computer system, comprising:

(A)   configuring a plurality of client terminals to reflect a set of user actions
that are associated with at least one type of user;

(B)   loading a set of simulated actions grouped into action types and associated
with a remote session;

(C)   measuring and logging response times for the set of simulated actions;

(D)   repeating (B) and (C) to obtain a plurality of response times;

(E)   aggregating the plurality of response times to obtain aggregated results;

(F)   splitting the aggregated results according to each action type;

(G)   determining an associated break point for each said action type, wherein
the associated break point corresponds to a minimally acceptable degree of performance
for each said action type; and

(H)   determining a selected break point that corresponds to a minimum average
response time, wherein the selected break point corresponds to a number of users that the
multi-user computer can support.